

**PROJECT TITLE:** Safflower Variety Performance Evaluation

**PERSONNEL:**

**Co-Principal Investigators:** Jerald R. Bergman, Safflower Coord.- Sidney  
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**OBJECTIVES:**

Safflower serves as an excellent crop component in many areas of northern Montana in flexible dryland rotations with small cereal grains; particularly in view of the status of oilseeds in the Federal Farm Program. A significant portion of the north central cropping area has climatic conditions suitable for production of safflower. It is the objective of this study to evaluate existing commercial entries along with promising experimental lines being developed at Sidney to determine varietal appropriateness, and subsequent release and recommendation information specific to environmental conditions in northern areas. The M.A.P.S. program is utilized to refine definition of cropping areas appropriate for the production of quality safflower.

**SUMMARY:**

Single trials were established annually on-station at Havre using standard plot techniques in a randomized complete block design. Entries were planted in 4 or 6-row plots, 20 feet in length on a 12-inch spacing utilizing a 'Rem' self propelled cone seeder equipped with 'Acra-plant' hoe openers. Plots were trimmed to 16 feet and harvested with a 'Hege 125C' plot combine. Other variables specific to the trials are listed in the data tables.

At Havre, total annual precipitation was 11.68 inches or 99 percent of the average of years since 1916. May through September precipitation was 5.25 inches or 66 percent of the long-term average. Yields were generally good. However, extreme heat coupled with drying winds in the latter part of June resulted in lower yields than would have been expected on the basis of the stand established.

**RESULTS:**

Yield, test weight and oil content data are summarized in Table 1. Test weights were generally very good and oil contents ranged from poor to good depending on variety or selection. Nine-year yield and percent oil summaries on selected entries are presented in Table 2.

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'Finch', Montana developed, currently yields very well among released, standard cultivars on a 'Nine-year Comparable Average' basis at Havre. 'Finch', a white-hulled line, features higher test weight; and serves as a more disease-resistant replacement for 'S-208' in the birdseed market. However, the average oil content of 'S-208' is three percent higher than that of 'Finch'.

'S-317', 'S-208' and 'S-541' continue to perform very well under dryland conditions in the Havre area as alternaria and/or pseudomonas disease organisms have generally not become factors limiting production.

FUTURE PLANS:

It is planned that these investigations be continued on an annual basis in on-going support of the Montana safflower breeding and variety development project.

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TABLE 1. DRYLAND FALLOW SAFFLOWER VARIETY NURSERY. NORTHERN AGRICULTURAL RESEARCH CENTER. HAVRE, MONTANA. 1990.

VARIETY OR SELECTION		YIELD	TEST WT	% OIL	% OIL
		LBS/AC	LBS/BU	@ DRY	@ 8%N
01	82B 1277	957.13	38.27	41.00	37.70
09	CENTENNIAL	948.70	40.57	45.27	41.63
02	82B 3555	948.27	40.43	44.67	41.07
17	88A 3697	941.70	38.87	45.60	41.97
13	FINCH	931.90	42.77	38.60	35.53
07	87B 1298	926.07	40.67	42.93	39.50
14	GIRARD	910.13	40.97	42.00	38.63
04	85B 1837	904.80	39.27	38.97	35.83
18	S-317	887.43	38.63	42.40	39.00
10	MONTOLA 2000	884.00	39.37	45.60	41.97
11	S-541	838.53	41.87	45.47	41.83
08	87B 1650	817.83	37.10	42.03	38.70
03	83B 1954	814.37	39.67	43.27	39.80
12	S-208	808.63	39.73	41.13	37.83
06	85B 4431	774.23	39.77	37.47	34.47
15	OKER	759.60	38.40	40.80	37.53
05	85B 3918	741.60	35.57	46.77	43.03
16	SAFFIRE	688.83	41.30	33.70	31.00

STATISTICAL SUMMARY	YIELD	TEST WT	% OIL	% OIL
	LBS/AC	LBS/BU	@ DRY	@ 8%N
EXPERIMENTAL MEANS	860.21	39.62	42.09	38.72
C.V. 2: (S OF MEAN/MEAN)*100	7.13	.94	1.27	1.27
LSD (0.05)	176.27	1.07	1.53	1.42

## CLIMATIC and NURSERY MANAGEMENT DATA

Seeding Date:	05/14/90	Soil Temp @ Sdg:	68F @ 2in., 59F @ 4in.
Harvest Date:	09/20/90	Root Penetration Depth:	N/A in.
Seeding Depth:	1.50 in.	Depth to Moisture at Sdg:	1.25 in.
Soil Series:	Kevin	Probed Moist.Depth @ Sdg:	55.0 in.+
Previous Crop:	Fallow	Herbicide:	Trifluralin @ .75# PPI
Measured Soil Water on 05/14/90:	7.50 in.	(sampling depth = 48 in.)	
Measured Soil Water at Harvest:	3.39 in.	(sampling depth = 48 in.)	
Growing Season Precipitation (Sdg. to 14 days prior to harvest maturity 'HM'):			
Total - all measurable events:	4.92 in.		
Total - all events >.1 inches:	4.41 in.		
Post Growing Season Precipitation (within 14 days of harvest maturity):			
Total - all measurable events:	0.16 in.		
Total - all events >.1 inches:	0.16 in.		
Adj'd Residual Soil Water @ (HM-14d):	3.23 in.	(sampling depth = 48 in.)	
Initial Soil Analysis (NO3,P,K at 0-6 in.; NO3 at 6-24, 24-36 & 36-48 in.):			
NO3(lbs/ac)= 232 , P(ppm olsen)= 17 , K(ppm)= 271 , pH= 8.0, O.M.(%) = 1.3			
Fertilizer:	45#N,30#P2O5 via granular blend b'dcast & incorp prior to planting		

TABLE 2. NINE-YEAR YIELD AND PERCENT OIL SUMMARY ON SELECTED ENTRIES FROM A FALLOW SAFFLOWER VARIETY PERFORMANCE NURSERY. NORTHERN AGRICULTURAL RESEARCH CENTER. HARE, MONTANA. 1982-1990.

VARIETY OR SELECTION	NO. OF YEARS TESTED	YIELD (POUNDS PER ACRE)					OIL (Percent by Weight) @ 8% MOISTURE										
		1986	1987	1988	1989	1990	AVERAGE FOR YEARS TESTED	8-YR. COMPAR. AVERAGE YIELD 2/	PERCENT OF S-208 YIELD 3/	1986	1987	1988	1989	1990	AVERAGE FOR YEARS TESTED	8-YR. COMPAR. AVERAGE OIL % 2/	PERCENT OF S-208 OIL % 3/
S-317	4	1659.6	1940.8	-	-	887.4	1265.1	1343.1	112.5	46.4	46.4	-	-	39.0	43.5	43.3	185.3
8283985	4	-	2152.7	1126.2	477.6	948.3	1178.2	1229.7	103.0	-	44.5	45.5	43.0	41.1	43.5	42.5	103.3
FINCH	7	1622.4	1871.6	960.8	819.5	931.9	1015.0	1211.1	101.4	40.2	41.2	42.1	39.7	35.5	38.9	38.4	93.4
S-208	9	1365.3	1870.9	1135.9	753.4	888.8	1194.2	1194.2	100.0	43.5	43.6	44.3	42.7	37.8	41.2	41.2	100.0
CENTENIAL	3	-	-	966.1	739.3	948.7	884.7	1174.8	98.4	-	-	47.0	44.6	41.6	44.4	43.9	186.7
S-541	9	1343.7	1942.3	965.3	603.5	838.5	1152.3	1152.3	96.5	45.6	46.9	47.7	45.2	41.8	44.5	44.5	108.0
8681837	3	-	-	885.5	751.5	904.8	858.6	1129.5	94.6	-	-	43.8	41.9	35.8	40.5	40.1	97.4
REBEIN	4	1577.3	-	-	-	-	1353.0	1128.0	94.5	37.1	-	-	-	-	35.4	38.1	87.6
8281277	3	-	1811.2	287.8	-	957.1	1018.7	1079.9	89.7	-	46.8	45.2	-	37.7	43.2	42.4	103.1
SAFFIRE	4	-	1869.0	848.2	695.5	688.8	1023.4	1078.0	89.6	-	38.5	36.2	34.3	31.0	34.5	33.7	82.0
HARTMAN	6	1236.9	1584.3	-	-	-	1174.9	1045.8	87.6	39.0	39.3	-	-	-	36.7	36.9	89.7
8381964	5	1158.5	1736.0	521.9	694.6	814.4	985.1	991.2	83.0	44.2	44.3	44.3	45.1	39.8	43.5	42.3	182.7
GIRARD	7	1060.9	1773.8	549.8	517.3	910.1	782.8	945.2	79.1	42.2	43.2	44.3	41.0	38.6	40.8	40.3	97.9
4/ OHER	8	790.5	1557.3	115.0	630.0	759.6	655.7	685.7	57.4	43.7	43.5	44.1	41.8	37.5	41.3	41.2	108.1
8583918	3	-	-	209.7	526.8	741.6	482.7	854.2	54.8	-	-	47.7	46.0	43.0	45.6	45.1	189.6
MEAN (ENTRIES LISTED)		1335.0	1828.2	713.7	656.3	856.9	-	1068.4	-	42.4	41.6	44.4	42.3	39.5	-	40.8	-
5/ Grwg Sun Ppt. (in.)		8.48	6.01	5.13	10.09	4.92	7.36										
6/ 9-in. CA to SDPit		9.39	11.61	9.76	8.01	7.50	8.70										
Tot Pit A/l Water (in.)		17.87	17.62	14.89	19.19	12.42	16.05										
Soil NO3(lbs) to SDPit		198.0	94.0	122.0	174.0	232.0											
SD (Sampling Dpth inches)		48.0	48.0	48.0	48.0	48.0											
Fertilizer App. (8 N)		43.0	43.0	39.0	39.0	45.0											
(8 P2O5)		43.0	43.0	32.0	32.0	30.0											

Check variety is S-208.

1/ Only the five most recent years are shown, but the summary calculations include all the years noted.

2/ 9-yr. CA = (x/y) \* z where x = average yield or oil content of the entry for years tested, y = average yield or oil content of S-208 for the same years, and z = 9-yr. average yield and oil content for the check variety S-208.

3/ Percent of S-208 yield or oil content for the same data years.

4/ 808 2793 in 1982, 808 2793-2 in 1983.

5/ Seeding to 14 days prior to harvest maturity.

6/ Depth of moist soil (ft.) \* 2.00 in. PAN/ft except starting in 1986 where soil PAN values are actual gravimetric measurements.